START

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PROPOSED PLAN FOR CLEANUP OF THE 1100 AREA SUPERFUND SITE AT HANFORD

PUBLIC COMMENT PERIOD ON ALTERNATIVES MAY 24 TO JULY 9, 1993

PUBLIC MEETING ON JUNE 30, 1993. 7:00 to 9:00 PM
RICHLAND PUBLIC LIBRARY
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955 NORTHGATE DRIVE, RICHLAND

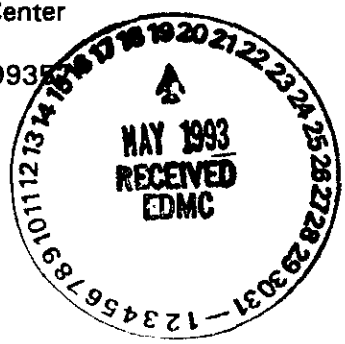
This Proposed Plan (Plan) describes the preferred alternative to clean up contaminated areas of the 1100 Area Superfund Site (the Site) at the U.S. Department of Energy's (DOE's) Hanford Site. This Plan also summarizes the other cleanup alternatives considered for the Site. The preferred alternative presented in this Plan is EPA's, Ecology's, and DOE's initial recommendation. The final cleanup activities will be selected only after the public comment period has ended and all of the comments have been reviewed and considered. We are seeking comments on all of the alternatives presented, not just the preferred alternative. Comments may be made in person at the June 30 public meeting or may be submitted in writing. Written comments must be submitted by July 9, 1993.

Send written comments to:

Dave Einan
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, WA 99352

This Plan summarizes information which is presented in greater detail in the Final Remedial Investigation/ Feasibility Study Report (Final RI/FS Report). The Administrative Record file contains all of the information used in the evaluation of the Site and cleanup alternatives, including the RI/FS Report, and is available at the following locations:

U.S. Department of Energy
Richland Field Office
Administrative Record Center
740 Stevens Center
Richland, Washington 993



EPA Region 10
Superfund Record Center
1200 Sixth Avenue
Park Place Building, 7th Floor
Mail Stop: HW-074
Seattle, WA 98101

Washington State Department of Ecology
Administrative Record
719 Sleater-Kinney Road SE
Capital Financial Building, Suite 200
Lacey, WA 98503-1138

DOE independently evaluated the activities associated with the preferred alternative under the National Environmental Policy Act (NEPA) and determined that those activities are eligible for categorical exclusion. However, nothing in this Plan, or other documents to be prepared, is intended to present a statement on the legal applicability of NEPA to remedial actions at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites.

ACTIVITIES TO DATE

The 1100 Area Superfund Site, placed on the National Priority List in July 1989, includes four "operable units": 1100-EM-1, 1100-EM-2, 1100-EM-3, and 1100-IU-1. An operable unit is a grouping of individual waste units based primarily on geographic area and common waste sources. The locations of the operable units are shown on Figure 1. For the remainder of this Plan, the "1100-" prefix will be dropped when referring to the operable units (*e.g.*, 1100-EM-1 will be referred to as EM-1). EM-1 was assigned the highest priority among the Hanford operable units due to its close proximity to

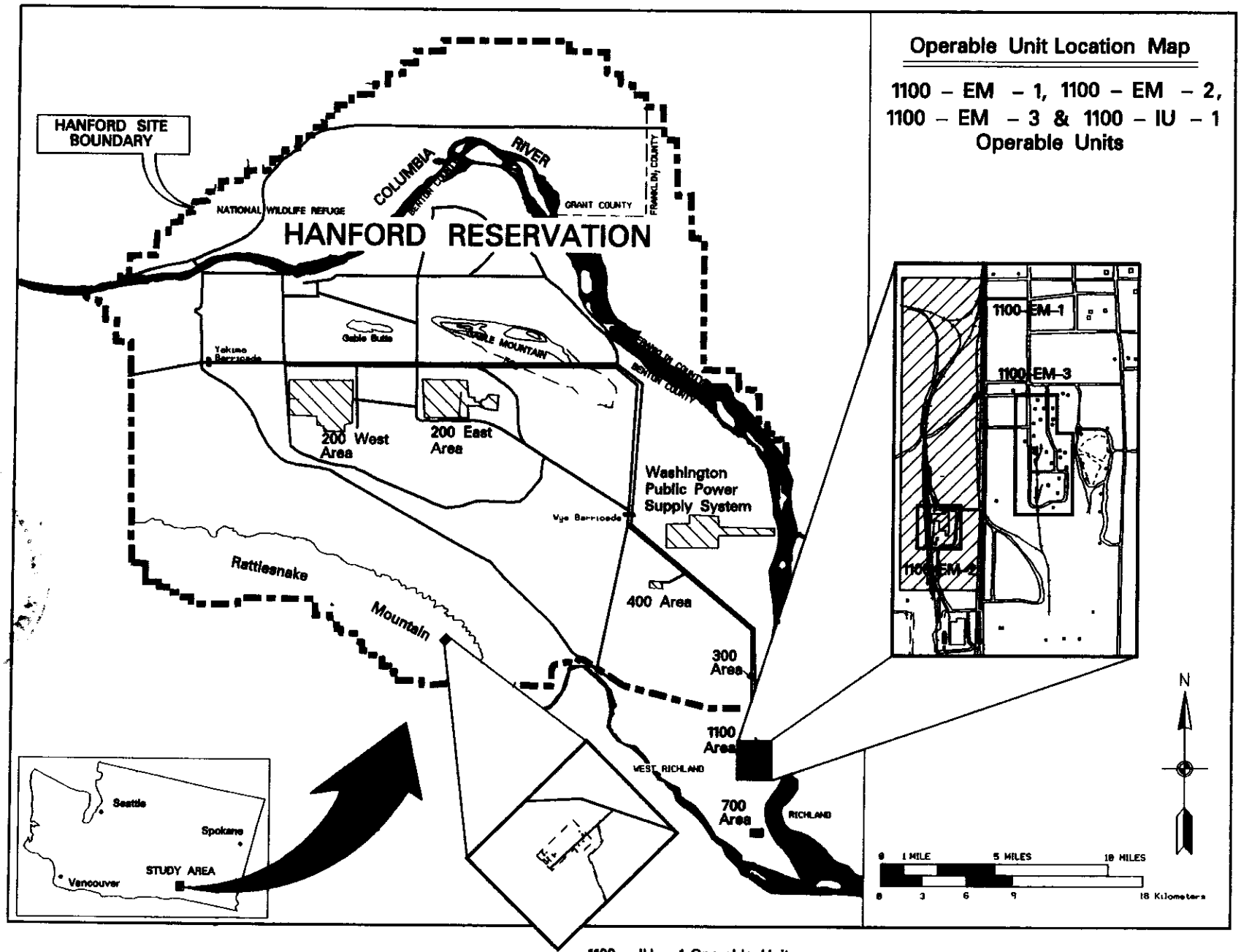


Figure 1

Figure 1

the North Richland well field. The RI/FS activities at EM-1 were initiated in 1989 and the Phase I RI/FS was completed in August 1990. In the fall of 1992, EPA, DOE, and Ecology decided to accelerate the study and evaluation of the other three operable units so that all remedial actions in the 1100 Area could proceed as a single project. In place of extensive field investigations, EM-2, EM-3, and IU-1 were evaluated by analysis of existing waste information, detailed visual inspections, and through interviews with site personnel. Since the EM-1 investigation was nearly complete at the time of the decision, the results from the evaluation of EM-2, EM-3, and IU-1 are contained in an addendum to the EM-1 RI/FS Report. This Plan also discusses EM-1 first, followed by the other operable units in one discussion.

The agencies have chosen this accelerated approach for EM-2, EM-3, and IU-1 because it focuses resources on cleanups now. We know enough now to proceed directly to cleanup since we are committing to remove contaminated soils and debris.

SITE BACKGROUND

EM-1

EM-1 contains the central warehousing, vehicle maintenance, and transportation distribution center for the entire Hanford Site. Additionally, the Horn Rapids Landfill is located in the northern portion of EM-1. A wide range of materials and potential waste products were routinely used at and near EM-1.

The RI/FS investigated seven areas and determined that three areas within EM-1 contained contaminants at levels that may pose potential long-term risks to human health. A description of each of these three areas and the contamination is provided below. The location of each area is shown on Figure 2. A summary of contaminants of concern and potential risks for EM-1 is presented in Table 1. In addition, Table 2 presents the cleanup goals and the remaining risks once the cleanup goals are met.

- **Discolored Soil Site (DSS).** At this site, bis(2-ethylhexyl)phthalate (BEHP) was spilled, resulting in the known contamination of approximately 100 cubic meters (130 cubic yards) of soil and potentially up to 340 cubic meters (440 cubic yards). Cleanup cost estimates were developed using the higher volume. BEHP is a probable human carcinogen and, when ingested in large doses, may cause other adverse health effects.

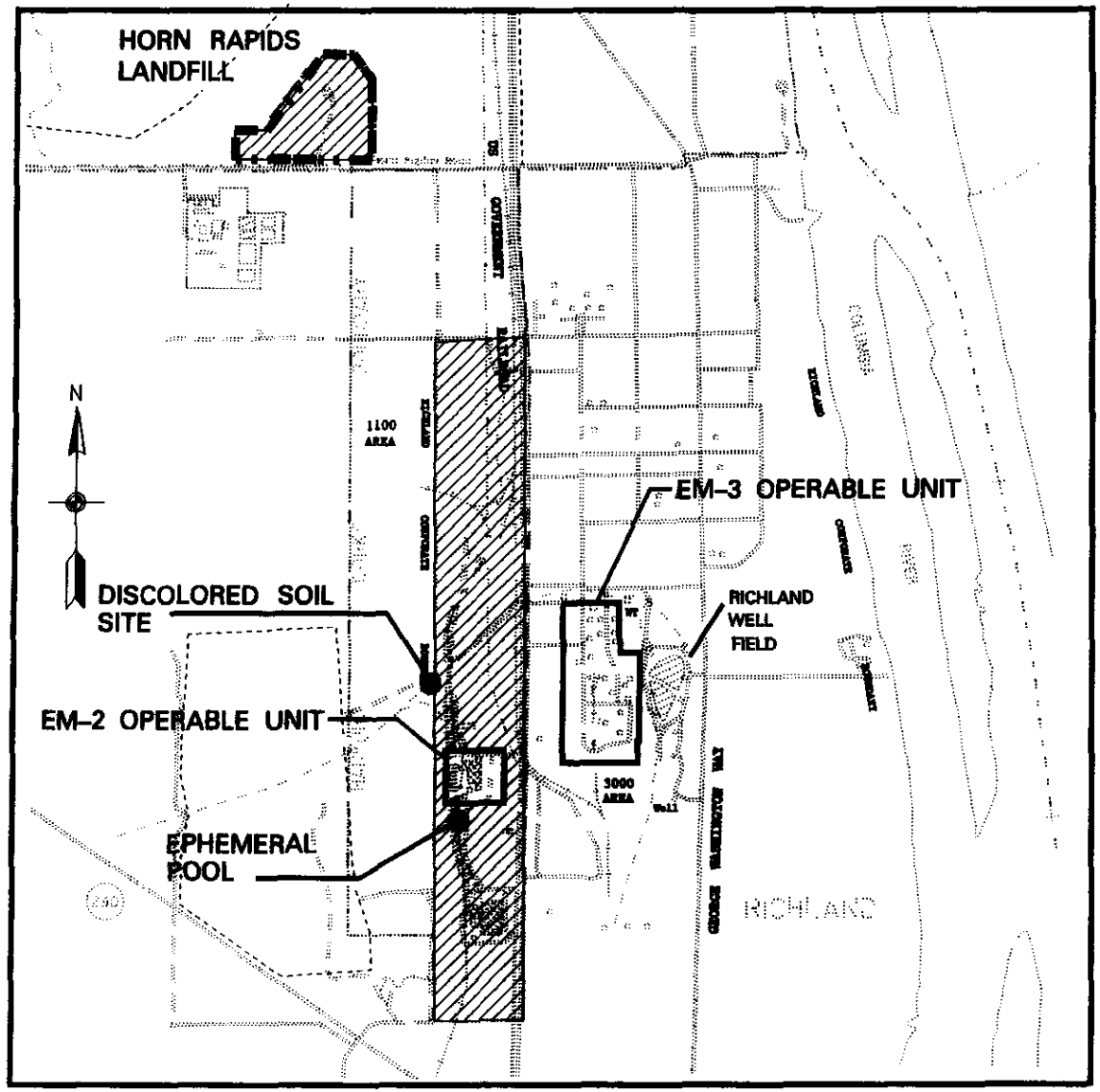
- **Ephemeral Pool (EPS).** This is an elongated depression adjacent to a parking area where runoff water collects and evaporates. Polychlorinated biphenyls (PCB's) from an unknown release at this site have contaminated approximately 125 cubic meters (165 cubic yards) of soil and potentially up to 250 cubic meters (340 cubic yards). Cleanup cost estimates were developed using the higher volume. PCB's are probable human carcinogens.

- **The Horn Rapids Landfill (the Landfill).** A landfill that was used primarily for the disposal of office and construction waste, asbestos, sewage sludge, and fly ash. Extensive investigations did not find any drums of organic liquids, which were alleged to have been disposed at the Landfill. Contaminants of concern are the asbestos distributed throughout the landfill, as well as approximately 460 cubic meters (600 cubic yards) of PCB-contaminated soils.

- **Groundwater.** Trichloroethylene- (TCE-) contaminated groundwater is found both upgradient and downgradient of the Landfill. Monitoring data indicates that the TCE contamination is the result of a single or limited spill. TCE has been listed as a probable human carcinogen, although that classification is under review. The TCE plume is approximately 1.6 kilometers (1 mile) long and 0.3 kilometer (0.2 mile) wide and is moving in a northeasterly direction. In addition, the groundwater monitoring network for the Landfill has detected nitrates and Technetium-99 (a radionuclide). These concentrations result in low-risk levels that would not trigger remedial action. A review of all available information indicates that contamination has moved onto the Site via the groundwater. An adjacent facility is investigating soil and groundwater contamination in accordance with the Washington State Model Toxics Control Act (MTCA).

EM-2, EM-3, AND IU-1

The EM-2 and EM-3 operable units are adjacent to EM-1 and also contain facilities supporting warehousing and vehicle maintenance activities. Eighteen waste sites within EM-2 and EM-3 were identified as candidates for remedial actions. IU-1 consists of a former NIKE Missile Base and Control Center on Rattlesnake Mountain. Thirty-two waste sites were identified within IU-1 as potential candidates for remedial actions. In all three operable



LEGEND :

● 1100-EM-1 Sub Unit location and Designation.

1100-EM-1 Operable Unit

0 500 1000 2000 METERS

0 3000 6000 FEET

1100-EM-1 Operable Unit Location Map.

Figure 2

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Table 1. Summary of Current Contamination and Risk at EM-1

EM-1 Area	Contaminant of Concern	Maximum Concentration	Potential Risk Residential	Potential Risk Industrial	Hazard Index Residential	Hazard Index Industrial
DSS	BEHP	25,000 ppm	7×10^{-4}	3×10^{-5}	5.1	0.4
EPS	PCB'S	42 ppm	1×10^{-3}	6×10^{-5}	-	-
Landfill	PCB'S	100 ppm	3×10^{-3}	1×10^{-4}	-	-
Groundwater	TCE	110 ppb	4×10^{-5}	-	-	-

Table 2. Cleanup Goals and Risk After Cleanup at EM-1

EM-1 Area	Contaminant of Concern	Cleanup Goal (from MTCA)	Remaining Risk Residential	Remaining Risk Industrial	Remaining Hazard
DSS	BEHP	71 ppm	2×10^{-6}	9×10^{-8}	none
EPS	PCB'S	1 ppm	3×10^{-5}	1×10^{-6}	
Landfill	PCB'S	50 ppm	No exposure and therefore no risk		
Groundwater	TCE	5 ppb	2×10^{-6}	-	

units, the waste sites primarily consist of tanks that were used for fuel and chemical solvent storage, transformers and pads, spills, and disposal areas.

The groundwater information currently available for EM-2, EM-3, and IU-1 indicates the presence of nitrates in groundwater beneath EM-3 and naturally-occurring high levels of fluoride at IU-1.

SUMMARY OF SITE RISKS

In the Superfund process, potential risks to human health and the environment are evaluated to determine whether significant risks exist due to site contaminants. Two types of potential human health effects due to contact with site contaminants are evaluated at Superfund sites. The first is the potential increase in cancer risks. This potential increase is expressed exponentially as 1×10^{-4}, 1×10^{-5}, 1×10^{-6} (one in ten thousand, one in one hundred thousand, one in a million, respectively). This means that for a 1×10^{-4} risk, if 10,000 people were exposed to a contaminant of concern for some period of time, one additional person could be expected to be diagnosed with cancer in his/her lifetime. Based on current national cancer rates, 2,500 people out of 10,000 are expected to be diagnosed with cancer. Under a 1×10^{-4} risk, 2,501 cancer diagnoses could be expected. Remedial actions generally are not required at risk levels below 1×10^{-4} unless there are other considerations such as adverse environmental impacts, potential for future migration, or uncertainty regarding future land use. For the second, non-carcinogenic health impacts, a Hazard Index (HI) is calculated. An HI greater than or equal to 1 may pose a potential adverse human health risk.

EM-1

Risk assessments were performed for EM-1 using both a current industrial scenario and a future residential scenario (see Table 1). Under the industrial scenario, the potential risks for the Discolored Soil Site, for the Ephemeral Pool, and for the Horn Rapids Landfill are within acceptable levels. Under a future residential scenario, if no cleanup actions were undertaken, the potential long-term risks for EM-1 would exceed acceptable levels.

Non-carcinogenic effects of the contaminants of concern were also evaluated. Under the industrial scenario, contaminants were below levels known to pose a human health risk. Under the future residential scenario, the levels would pose some risk.

The groundwater contaminants do not present current risks to human health because: (1) There are no current human users of the groundwater and (2) the remedial investigation determined that the North Richland well field is not downgradient of the contaminated groundwater plume. It should be emphasized that the well field is approximately 2 miles to the southeast of the contaminant plume, while the plume is travelling to the northeast. Attainment of the Safe Drinking Water Act Maximum Concentration Level (MCL) for TCE was addressed due to the fact that the future use of groundwater as a drinking water source cannot be ruled out entirely.

An Ecological Risk Assessment was also undertaken to evaluate potential adverse effects of onsite contaminants on the flora and fauna present in onsite ecosystems. That assessment indicated that there are no adverse impacts to onsite ecosystems associated with EM-1 contaminants.

EM-2, EM-3, and IU-1

A qualitative evaluation of overall potential risk from these operable units was made by comparing possible waste site contaminant levels with existing State and Federal health-based guidelines. Those guidelines will be used to establish cleanup goals for these operable units.

SCOPE AND ROLE OF ACTION

This Proposed Plan addresses contaminated soils found at EM-1 and the contaminated groundwater in the vicinity of the Landfill. In addition, the Plan presents surface and soil cleanups in the other three operable units, as well as additional groundwater activities. The current and expected future use of IU-1 is that it will remain part of the Arid Lands Ecology (ALE) Reserve. The current and near term future use of the rest of the 1100 Area is industrial. However, the longer term use is undetermined at this time.

For EM-1, the cleanup objectives are to prevent current and future exposure to the contaminants through removal, treatment, containment, or the use of institutional controls, as well as to prevent potential migration of soil contaminants to the groundwater. Although the cleanup objectives for the other three operable units are the same, they will be met by removing contaminants from the uncontrolled environment and disposing of them in a proper manner.

SUMMARY AND EVALUATION OF ALTERNATIVES

The CERCLA process requires evaluation of a "no-action" alternative to establish a baseline for comparison. For the EM-1 sites and EM-2, EM-3, and IU-1, this was Alternative 0. The No-Action alternative does not meet the statutory requirements for protection of human health and the environment and therefore is not discussed further in this Plan.

The remedial alternatives evaluated for EM-1 are presented first. The remedial alternatives evaluated for the other three operable units follow. Due to the fact that soil and groundwater contamination are independent of each other at EM-1, the Final RI/FS evaluated soil and groundwater alternatives separately. The presentation of alternatives in this Plan uses a shorthand notation to identify alternatives in place of the numbering system used in the RI/FS. However, the descriptive titles of the alternatives are the same in the RI/FS and in this Plan.

Summary of EM-1 Alternatives

EM-1 SOILS

Discolored Soil Site

Alternative DSS-1: Onsite Bioremediation. The BEHP-contaminated soils would be bioremediated onsite. Bioremediation is a process where nutrients, and sometimes water, are added to contaminated soil to promote the growth of naturally-occurring microorganisms which "feed" on the organic contaminants. The contaminants are reduced or eliminated by this process. The treated soils would be placed back into the excavated area if treatment standards are achieved. The total estimated cost for this alternative is $997,000.

Alternative DSS-2: Onsite Incineration. The BEHP-contaminated soils would be incinerated onsite. The residuals from the incineration would be placed back in the excavated area and covered with 6 inches of soil. The total estimated cost for this alternative is $1,491,000.

Alternative DSS-3: Offsite Incineration. Under this alternative, the BEHP-contaminated soils would be excavated, transported by a licensed hazardous waste hauler, and treated at a permitted incinerator; the ash would be disposed of in an offsite, permitted landfill. The excavated area would be back-filled with clean fill. The total estimated cost for this alternative is $2,131,000.

The preferred alternative for the Discolored Soil Site is DSS-3. Exposure to contaminated soils is eliminated by removal and complete destruction of the contaminant. Offsite incineration is the most certain, practical, and effective way to treat these soil contaminants.

Ephemeral Pool Soil

Alternative EPS-1: Offsite Disposal. The Ephemeral Pool soils contaminated with PCB's above 1 ppm would be excavated, transported by a licensed waste hauler, and disposed of in a permitted facility. The excavated area would be regraded and back-filled with clean soil. The total estimated cost for this alternative is $356,000.

Alternative EPS-2: Onsite Incineration. The PCB-contaminated soils would be incinerated onsite in a rotary kiln. The residuals from the incineration would be placed back in the excavated area and covered with 6 inches of soil. The total estimated cost for this alternative is $1,391,000.

Alternative EPS-3: Offsite Incineration. The Ephemeral Pool soils contaminated with PCB's above 1 ppm would be excavated, transported by a licensed waste hauler, and treated at a permitted offsite incinerator; the ash would be disposed of in an offsite, permitted landfill. The excavated area would be back-filled with clean material and regraded. The total estimated cost for this alternative is $1,214,000.

The preferred Ephemeral Pool alternative is EPS-1. Exposure to PCB-contaminated soil is prevented by removing the soils and properly disposing of them. Offsite disposal will be very effective in handling these soils.

Horn Rapids Landfill

Alternative HRL-1: Asbestos Cap. The Landfill would be capped with 60 centimeters (2 feet) of clean soil to meet Federal requirements for capping inactive landfills containing asbestos. The total estimated cost of this alternative is $2,011,000. Additional estimated cost associated with disposal of approximately 23 cubic meters (30 cubic yards) of soils with PCB's greater than 50 ppm is $95,000 for offsite disposal.

Alternative HRL-2: Municipal Landfill Cap. Under this alternative, the Landfill would be capped in accordance with the State of Washington requirements for capping a municipal solid waste landfill in an arid region. This is an impermeable cap that consists of (from top down) a minimum 15-centimeter (6-inch) topsoil cover, a synthetic liner, and a layer of clean fill in order to establish sufficient grades for surface water runoff. The total estimated cost of this alternative is $5,445,000. Additional estimated cost associated with disposal of approximately 23 cubic meters (30 cubic yards) of soils with PCB's greater than 50 ppm is $95,000 for offsite disposal.

The preferred alternative for the Landfill is HRL-1. Potential exposure to asbestos-contaminated soils is prevented by the cap which prevents fugitive dust emissions. Municipal landfill caps are designed to prevent leaching of contaminants; however, at the Landfill, the contaminant that poses a risk is asbestos, which is not a substance that might leach

into groundwater. The asbestos cap is, therefore, best suited to prevent exposure.

EM-1 GROUNDWATER

Alternative GW-1: Natural Attenuation, Monitor, Evaluate Need for Further Action. Under this alternative, the groundwater contamination would be allowed to naturally attenuate. Groundwater monitoring and modelling have indicated that the TCE plume is expected to attenuate to levels below MCL's by the year 2017. Well restrictions would be enforced during this period. Under this alternative, additional wells would be installed and regularly monitored along George Washington Way as an early warning system. In the event that TCE concentrations exceed MCL's at the well sites, active groundwater remediation such as extraction and treatment would be evaluated. The total estimated cost for this alternative is $1,059,000.

Alternative GW-2A: Extraction and Treatment. TCE would be removed from contaminated groundwater by pumping groundwater through an air stripper. Air emissions from this process would contain low levels of TCE that are not expected to require additional treatment. The treatment system would operate at 100 gallons per minute (gpm). TCE levels in groundwater would be expected to reach MCL's by the year 2012. The total estimated cost for this alternative is $5,111,000.

Alternative GW-3A: Extraction and Treatment. This is the same treatment process as GW-2A. However, this system would operate at 300 gpm. TCE levels in groundwater would be expected to reach MCL's by the year 2008. The total estimated cost for this alternative is $8,989,000.

Alternative GW-2B: Extraction and Treatment. Extracted groundwater would be treated for TCE removal by a system consisting of a multimedia filter and an ultraviolet radiation/chemical oxidation treatment unit using ozone and hydrogen peroxide to destroy TCE. In this process, TCE is chemically destroyed and converted to carbon dioxide and water. The process would operate at 100 gpm and TCE levels in groundwater would be expected to reach MCL's by the year 2012. The total estimated cost for this alternative is $5,714,000.

Alternative GW-3B: Extraction and Treatment. This is the same treatment process as GW-2B. However, this system would operate at 300 gpm. TCE levels in groundwater would be expected to reach MCL's by the year 2008. The total estimated cost for this alternative is $9,970,000.

The preferred groundwater alternative is GW-1. Groundwater contamination will be allowed to naturally attenuate to below MCL's under this alternative. The preferred alternative applies well restrictions to reduce the potential of exposure to contaminants and includes monitoring to ensure that no future releases occur. The timeframe to achieve MCL's in groundwater using this alternative is approximately 25 years, which is longer than the timeframes (16 to 20 years) for remediation under Alternatives GW-2A, GW-2B, GW-3A, and GW-3B. Because this groundwater is not used as a drinking water source, there are no current potential risks to human health. When considered against the other balancing criteria, the potential reduction in time (5 to 9 years) for the groundwater treatment alternatives is not sufficient to offset the additional costs ($4,000,000 to $8,000,000).

PREFERRED ALTERNATIVE FOR EM-1

The preferred alternative for EM-1 is the combination of the following alternatives:

Discolored Soil Site: Offsite Incineration of BEHP-Contaminated Soils, Alternative DSS-3.

Ephemeral Pool: Offsite Disposal, Alternative EPS-1.

Horn Rapids Landfill: Asbestos Cap, Alternative HRL-1.

Groundwater: Natural Attenuation and Monitoring for Compliance with MCL's, Alternative GW-1.

Implications for Future Site Use. In December 1992, the Hanford Future Site Uses Working Group recommended that the 1100 Area, including ALE, be cleaned up to a level that would support unrestricted use. At the Discolored Soil Site and the Ephemeral Pool, Washington State MTCA residential cleanup standards will be met, thus supporting unrestricted use.

For the Landfill, approximately 30 cubic yards of soils with PCB's greater than 50 ppm will be excavated and disposed of to meet requirements of the Toxic Substances Control Act. This action, together with soil capping, fencing, and land use restriction at the Landfill, will be consistent with overall MTCA requirements. Although this action at the Landfill does not totally meet the unrestricted land-use goal of the Hanford Future Site Uses Working Group, we have concluded that it is not justified to remove or treat the large volume of low-threat waste (*e.g.*, construction and asbestos debris) in the landfill. However, the Landfill area could be developed in the future for other uses, although not residences. Either alternative for the Landfill would support other, non-residential uses.

The agencies invite comment on the rationale we used in evaluating future use implications.

Evaluation of EM-1 Alternatives

The preferred alternative is believed to provide the best balance of trade-offs among the alternatives with respect to the nine evaluation criteria used to evaluate remedies. A description of those criteria is presented in the Glossary at right. The criteria fall into three categories: The first two (Overall Protection of Human Health and the Environment and Compliance with ARAR's) are considered threshold criteria and, in general, must be met unless waivers are granted. The next five are considered balancing criteria and are used to compare technical and cost aspects of alternatives. The final two criteria (State and Community Acceptance) are considered modifying criteria. Modifications to remedial actions may be made based upon state and local comments and concerns. These will be evaluated after all public comments have been received. The following paragraphs present the evaluation of how the alternatives satisfy the first seven criteria.

Overall Protection of Human Health and the Environment: The preferred alternative is protective because it removes and treats the contaminated soils at the Discolored Soil Site and removes and properly disposes of the contaminated soils at the Ephemeral Pool. Exposure to asbestos (the principal threat) at the Landfill would be prevented by providing an asbestos-landfill cap to contain the soils by preventing windblown dust. Exposure to contaminated groundwater is also prevented while

GLOSSARY OF EVALUATION CRITERIA

- **Overall Protection of Human Health and the Environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARAR's** addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements (ARAR's) of other Federal and State environmental laws and/or justifies a waiver.

- **Long-Term Effectiveness and Permanence** refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

- **Reduction of Toxicity, Mobility, or Volume** through treatment is the anticipated performance of the treatment technologies that may be employed in a remedy.

- **Short-Term Effectiveness** refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment during the construction and implementation period.

- **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the solution.

- **Cost** includes capital and operation and maintenance costs.

- **State Acceptance** indicates whether, based on its review of the Final RI/FS Report and Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.

- **Community Acceptance** will be assessed in the Record of Decision following a review of the public comments received on the Final RI/FS Report and the Proposed Plan.

the contamination attenuates to levels that do not pose undue risks.

Alternative DSS-1 would reduce the levels of BEHP, but it may not be completely successful because the technology is unproven beyond laboratory-scale tests. Alternative DSS-2, EPS-2, and EPS-3 would be fully protective of human health and the environment because these alternatives would destroy the contaminants at the sites. Alternative HRL-2 would also prevent exposure to asbestos. Groundwater Alternatives GW-2A, GW-2B, GW-3A, and GW-3B would be protective by preventing exposure and would also utilize groundwater extraction and treatment for some additional measure of protection.

Compliance with ARAR's: All of the soil alternatives can meet all identified ARAR's, with the possible exception of Alternative DSS-1. Alternative DSS-1 may not be efficient enough to meet cleanup levels. The ARAR requirements are outlined in detail in the Final RI/FS Report. All of the groundwater alternatives would achieve ARAR's, although the timeframes vary from 16 years to 25 years.

Long-Term Effectiveness and Permanence: Alternatives DSS-2, DSS-3 (part of the preferred alternative), EPS-2, and EPS-3 have the highest degrees of effectiveness and permanence because they employ incineration to destroy the contaminants. Alternative DSS-1 would be permanent, but the technology is unproven beyond laboratory-scale tests. Both HRL-1 and HRL-2 will be effective for the life of the caps. The estimated useful life of landfill caps is 30 to 50 years. In practice, the useful life could be much longer depending on site conditions and use. All of the groundwater alternatives would be expected to provide long-term effectiveness once cleanup goals are attained. As noted above, the timeframes to achieve cleanup goals vary.

Reduction of Toxicity, Mobility, or Volume: Soil Alternatives DSS-2, DSS-3 (part of the preferred alternative), EPS-2, and EPS-3 utilize treatment to reduce contaminant volume, mobility, and toxicity. Alternative DSS-1 also utilizes treatment, but as previously described, the degree of reduction is unproven. Alternatives HRL-1, HRL-2, and EPS-1 utilize containment to reduce the mobility of contaminants. All groundwater alternatives reduce TCE toxicity, and Alternatives GW-2A, GW-2B, GW-3A, and GW-3B all employ technologies that would reduce mobility and volume.

Short-Term Effectiveness: All of the soil alternatives would create some level of short-term risk until the actions are completed. The soil actions could be completed within a 6 to 9 month timeframe, with the possible exception Alternative DSS-1, due to the uncertainties associated with bioremediation. Alternative HRL-2, which requires specialized equipment to install the synthetic liner, would also take longer to complete. Alternatives GW-3A and GW-3B would achieve cleanup goals in the shortest timeframe (approximately 16 years). Emissions from the air stripper used in GW-2A and GW-3A are relatively low and should not require additional treatment. Neither the active nor passive alternatives pose any undue risks for implementation.

Implementability: All of the soil alternatives can be implemented, although with varying degrees of difficulty. Mobilizing an onsite incinerator (required for DSS-2 and EPS-2) poses additional difficulties. The bioremediation option (DSS-1) would require treatability testing prior to implementation. All groundwater alternatives are readily implementable.

Costs: The estimated costs of the Discolored Soil Site alternatives range from $997,000 to $2,131,000. The estimated cost for the preferred DSS alternative (DSS-3) is $2,131,000.

The estimated costs of the Ephemeral Pool alternatives range from $356,000 to $1,391,000. The estimated cost for the preferred EPS alternative (EPS-1) is $356,000.

The estimated costs of the Landfill alternatives range from $2,106,000 to $5,540,000. The estimated cost for the preferred Landfill alternative (HRL-1) is $2,106,000.

The estimated costs of the groundwater alternatives range from $1,059,000 to $9,970,000. The estimated cost for the preferred groundwater alternative (GW-1) is $1,059,000.

Summary of EM-2, EM-3, and IU-1 Alternatives

EM-2, EM-3, AND IU-1 SOIL AND DEBRIS

In all three operable units, the waste sites primarily consist of tanks that were used for fuel and chemical solvent storage, transformers and pads, spills, and disposal areas.

The following activities are being considered for completing investigations and for cleanup of the sites within the three operable units. Two alternatives for cleanup of the soils and debris are considered following this section.

Common Elements

Regardless of which cleanup alternative is selected, the following activities will occur at all three operable units.

- Field screening tests, soil gas and geophysical surveys to determine the presence of contaminants and underground piping or tanks. Trenching would be used in conjunction with these surveys as needed.

- Excavation of underground storage tanks, pipes, sumps, and cisterns along with visibly stained or contaminated soils.

- Field sampling would be conducted during excavation to ensure that all contaminated soils are removed.

- All excavated materials would be stored onsite until they can be disposed of offsite or incinerated.

- All excavated areas would be back-filled with clean fill and revegetated to match surrounding topography.

- Should any unexploded ordnance be found, the U.S. Army Corps of Engineers, Huntsville (Alabama) District, Explosive Ordnance Engineering Center would be notified and assistance requested.

Some of the field screening and information-gathering activities listed above will continue while we take public comment and prior to the selection of a final cleanup alternative. These activities will be undertaken in order to better define areas for cleanup and to accelerate cleanup activities after the final actions are selected.

Cleanup Goals were developed for potential contaminants during the evaluation of EM-2, EM-3, and IU-1. The cleanup goals are human health-based values for soil contaminants developed by EPA Region 10 and Ecology. The cleanup goals for EM-2, EM-3, and IU-1 are summarized in Table 3. A complete listing of all the cleanup goals (also called preliminary remediation goals) considered for EM-2, EM-3, and IU-1 can be found in Volume IV of the Final RI/FS Report. Contaminated soils found at levels above the cleanup goals will be remediated.

Table 3. Cleanup Goals for EM-2, EM-3, and IU-1 Soils

CONTAMINANT	Cleanup Goal (from MTCA)
1,1,1-Trichloroethane	7,200 ppm
PCB's	1 ppm
Carbon Tetrachloride	8 ppm
Aniline	175 ppm
Furfuryl Alcohol	240 ppm
Dimethylhydrazine	0.0007 ppm
Acetone	8,000 ppm
Chromium Trioxide	400 ppm
Sodium Dichromate	400 ppm
Trichloroethylene (TCE)	91 ppm
Ethylene Glycol	160,000 ppm
Benzene	35 ppm
Toluene	0.3 ppm
Ethylbenzene	8,000 ppm
Xylenes	160,000 ppm
PAH's	1 ppm

In addition, in the event that substantially different types or quantities of contaminants are found, the agencies will consider this information and decide if a different remedial action would be more appropriate. We will inform you of such situations and substantial

changes to the remedy usually include additional public comment opportunities.

Alternative S-1: Offsite Disposal. Under this alternative, the activities listed as common elements would be implemented, then contaminated materials would be transported and disposed of in accordance with applicable State and Federal requirements. The estimated cost of this alternative is $4,455,000

Alternative S-2: Onsite Incineration. Onsite incineration would be limited to contaminated soils, sediments, and small debris. Larger items such as tanks, piping, and demolition debris would be disposed of offsite. The incinerator residuals would be placed back into the excavated areas and covered with clean fill. The estimated cost of this alternative is $7,974,000.

PREFERRED ALTERNATIVE FOR EM-2, EM-3, AND IU-1

The preferred alternative for EM-2, EM-3, and IU-1 is:

S-1: Offsite disposal of contaminated soil and debris.

If we find soil contamination that indicates the potential for impacts to groundwater, groundwater monitoring to identify appropriate remedial measures would be undertaken.

The preferred alternative will reduce potential risks associated with the sites by removing and disposing of contaminated soils and debris. In addition, potential impacts to groundwater would be more fully characterized and appropriate remedial measures would be evaluated and implemented, if needed, after additional public review and comment. In December 1992, the Hanford Future Site Uses Working Group recommended that the 1100 Area, including ALE, be cleaned up to a level that would support unrestricted use. The preferred alternative will result in cleanup that supports unrestricted use.

EVALUATION OF EM-2, EM-3, AND IU-1 ALTERNATIVES

In the following analysis, Alternatives S-1 and S-2 are evaluated in relation to one another for each of the evaluation criteria. The purpose of this analysis is to identify the relative advantages and disadvantages of each alternative.

Overall Protectiveness. Alternatives S-1 and S-2 would meet the remedial action objectives. For Alternative S-1, protection of human health would be provided by reducing the risks through removal and offsite disposal. Alternative S-2 would achieve protection through incineration.

Compliance with ARAR's. In the event that contamination levels exceeding State or Federal criteria are found, Alternatives S-1 and S-2 have the potential of meeting ARAR's. The efficiency of cleanup activities would need to be evaluated in order to determine whether MTCA cleanup levels can be met. Confirmatory sampling would be required to make such a determination.

Long-Term Effectiveness. Alternative S-1 has a high degree of long-term permanence because contaminants are removed offsite to a controlled facility. Alternative S-2 offers a greater degree of long-term permanence because this alternative uses a treatment method that permanently reduces toxicity through destruction. No long-term maintenance is currently expected for the waste sites.

Reduction of Toxicity, Mobility, or Volume. Alternative S-1 would reduce onsite toxicity, mobility, and volume through offsite disposal. Under Alternative S-2, toxicity, mobility, and volume reduction for contaminants present in the incinerated materials would be achieved. Overall soil volume is not reduced through incineration.

Short-Term Effectiveness. Both alternatives present relatively low risks to the community during implementation. Some fugitive dust emissions from excavation activities can be anticipated and, therefore, dust control procedures will be utilized to protect both remedial workers and the community. Alternative S-1 is estimated to take less than 1 year to complete, while Alternative S-2 would take 1 to 2 years to implement.

Implementability. Offsite disposal facilities considered in Alternative S-1 all have adequate capacity to receive potentially contaminated soils and debris. Also, there are numerous licensed haulers who are able to transport such materials. Alternative S-2 requires mobilization, set up, and trial testing of the incinerator to ensure that applicable standards

are met. Operating personnel would be supplied by the vendor.

Cost. Alternative S-1, Offsite Disposal, is estimated to cost $4,455,000, while Alternative S-2, Onsite Incineration, is estimated to cost $7,974,000.

EM-2, EM-3, and IU-1 GROUNDWATER

In the event that the remedial activities described above indicate the potential for impacts to groundwater from waste site contaminants, groundwater monitoring locations would be established. Five preliminary locations have been identified for EM-3 and one location for IU-1. These locations were identified based on proximity to waste sites. The cost associated with establishing and monitoring the six monitoring locations is estimated to be $1,983,000.